## 4.14 System Engineering Process Management

### 4.14.1 Introduction to System Engineering Process Management

The System Engineering Council (SEC) promotes use of the standard System Engineering (SE) processes in the Federal Aviation Administration/Air Traffic Organization (FAA/ATO) via System Engineering Manual (SEM) publication and SE training course offerings. The SEC owns the SE processes, as captured in the SEM and taught in SE training courses, and is thus responsible for process maintenance and improvement. Implementation of the SE processes is the responsibility of the implementing organization, with assistance available from the SEC. The SEC is likewise responsible for SEM maintenance and for making sure that SE training materials reflect the SE processes as documented in the SEM.

SE processes must continuously be monitored and improved to optimize performance and adapt to change. The SEC promotes SE process improvement and workforce training, as well as technological innovation, corresponding to integrated Capability Maturity Model (iCMM) Process Areas 21 (Process Improvement), 22 (Training), and 23 (Innovation) respectively. These activities are discussed in the following sections, and the process is summarized in Figure 4.14-1.

**Process:**

## Perform System Engineering Process Management

**ID No.:** 4.14 (iCMM PA 21, 22, 23)
**Date:** May 20, 2004
**Revision Date:** September 30, 2004

**Next Higher Level Process:**
Perform System Engineering

**Process Owner:**
System Engineering Council

**Process Objective:**
Maintain and improve the system engineering process.

**Inputs**

a) SE processes, SEM
b) SE training course materials
c) SEM comments
d) SE training information (course critiques, training statistics, etc.)
e) SE products
f) Appraisal results
g) Other FAA processes
h) SE innovations

**Providers**

a) SEC
b) SEC
c) SE
d) SE
e) SE
f) EXT
g) EXT
h) SE

**PROCESS TASKS**

**Beginning Boundary Task**
Monitor performance

- Define improvement
- Develop process improvement plan

**Ending Boundary Task**
Implement improvement

**Lifecycle Phase**

- ☑ Mission Analysis
- ☑ Investment Analysis
- ☑ Solution Implementation
- ☑ In-Service Management
- ☑ Service Life Ext.
- ☐ Disposal

**Outputs**

a) SE process changes, SEM revisions
b) SE training course material revisions

**Customers**

a) SE, EXT
b) SE, EXT

**Figure 4.14-1. SE Process-Based Management Chart**

### 4.14.2 Objectives of System Engineering Process Management

SE Process Management objectives are to:

- Maintain and improve SE processes
- Train the workforce on the SE processes
- Incorporate technological innovation

### 4.14.3 Inputs

This process requires a minimum of two types of inputs: (1) SE processes and related materials and (2) the information that may lead to a modification or improvement in the SE processes and/or related materials.

#### 4.14.3.1 System Engineering Processes and Related Materials

##### 4.14.3.1.1 System Engineering Processes

The SE processes, as documented in the SEM and implemented across the FAA, are the primary input to SE process management and the reason for existence of the process.

##### 4.14.3.1.2 System Engineering Manual

The latest version of the SEM is maintained in PDF (portable document format) on the Internet at http://www.faa.gov/asd/SystemEngineering/index.htm. The SEM technical editor maintains the latest SEM Microsoft Word files.

##### 4.14.3.1.3 System Engineering Training Materials

The SEC shall ensure that SE training offered at the FAA accurately reflects the process in the SEM. Instructors will incorporate accepted comments into the next version of training materials. If required, resolution of comments will also be incorporated into the SEM. Likewise, when resolution of comments involving the SEM requires an update to the training, the SEC member responsible for that section, or person designated by the SEC, will update training materials. This ensures that the SEM and FAA System Engineering training are in sync and results in continuous improvement to the SE processes.

#### 4.14.3.2 Monitored Inputs

##### 4.14.3.2.1 System Engineering Manual Comments

SEM comments are submitted via the Web site hosting the SEM. The SEM comment point of contact (POC) collects the comments and enters them into the SEM comment database. The SEC shall address SEM comments per the process described in4.14.4.1.1.

##### 4.14.3.2.2 System Engineering Training Information

The SEC shall use student critiques of the SE training course to determine the need for changes to the SE process or course materials. Attendance records plus course demand information will be used to determine future training requirements. Instructors shall develop courses, determine need to make changes, make the changes, and maintain configuration management over course materials.

#### 4.14.3.2.3 System Engineering Products

The SEC shall review National Airspace System (NAS) SE products. These include, but are not limited to, requirements documents, such as Interface Requirements Documents, line services' tailored SEMs, and NAS Architecture work products, to identify potential issues. This review is not as in depth as the periodic appraisal process, but attempts instead to identify obvious SE process problems and collect SEM implementation lessons learned.

#### 4.14.3.2.4 Appraisal Results

The SEC shall use results of periodic appraisals to identify and examine the need for potential SE process improvements.

#### 4.14.3.2.5 Other FAA Processes

SE process management is concerned with other FAA/ATO business processes, including the Acquisition Management System (AMS) and iCMM, which coexist with the SE processes. The processes should complement each other as much as possible without conflict, since the update period for these documents are not the same.

#### 4.14.3.2.6 System Engineering Innovations

SE has been recognized as an important engineering discipline for many years, and several innovations have been introduced to improve it. Technological advances have resulted in the introduction of SE tools that implement existing processes and pave the way for development of even more advanced processes. These advances often come from educational institutions and technical organizations.

### 4.14.4 Process Steps

#### 4.14.4.1 Monitor Performance

The SEC shall monitor the inputs to this process as described in the following sections.

#### 4.14.4.1.1 System Engineering Manual Comment Process

The SEC shall track and address comments regarding the SEM. Comments are processed as follows and summarized in Figure 4.14-2.

1. The SEM comment POC, whose e-mail address is listed on the SEM Web site, receives comments on the SEM.

2. The POC records comments in a Microsoft Access database.

3. The SEC assigns comments of an editorial nature to the SEM technical editor for resolution. Remaining comments are assigned to the SEC for disposition.

4. The SEM technical editor resolves assigned editorial comments.

5. SEC screens noneditorial comments for validity. Comments accepted by the SEC are assigned to the appropriate SEM author for resolution. Comments not accepted are assigned to the SEM comment POC to record resolution status in the database of SEM comments.

6. The SEM author proposes to the SEC a resolution to assigned comments.

7. The SEC approves or disapproves proposed comment resolutions. Disapproved resolutions are either assigned back to the author for further disposition, or the SEC develops an alternative resolution.

8. Approved comment resolutions are incorporated into the SEM by the SEM author or technical editor.

9. The technical editor or author (whoever did not incorporate the change) reviews the change.

10. The SEM comment POC records the resolution in the central repository.

11. The SEM author (who is responsible for both SEM and course materials) updates the associated SE course, if required.

The Status field in the SEM comment database shall be limited to the following:

- OPEN Awaiting SEC Review
- CLOSED No Action Taken
  - SEC Non-Concurs; or
  - Comment is too general with lacking rationale and/or suggested corrective action; or
  - Comment is no longer relevant due to other changes or circumstances; or
  - Duplicate comment exists.
- OPEN Assigned
- CLOSED Incorporated

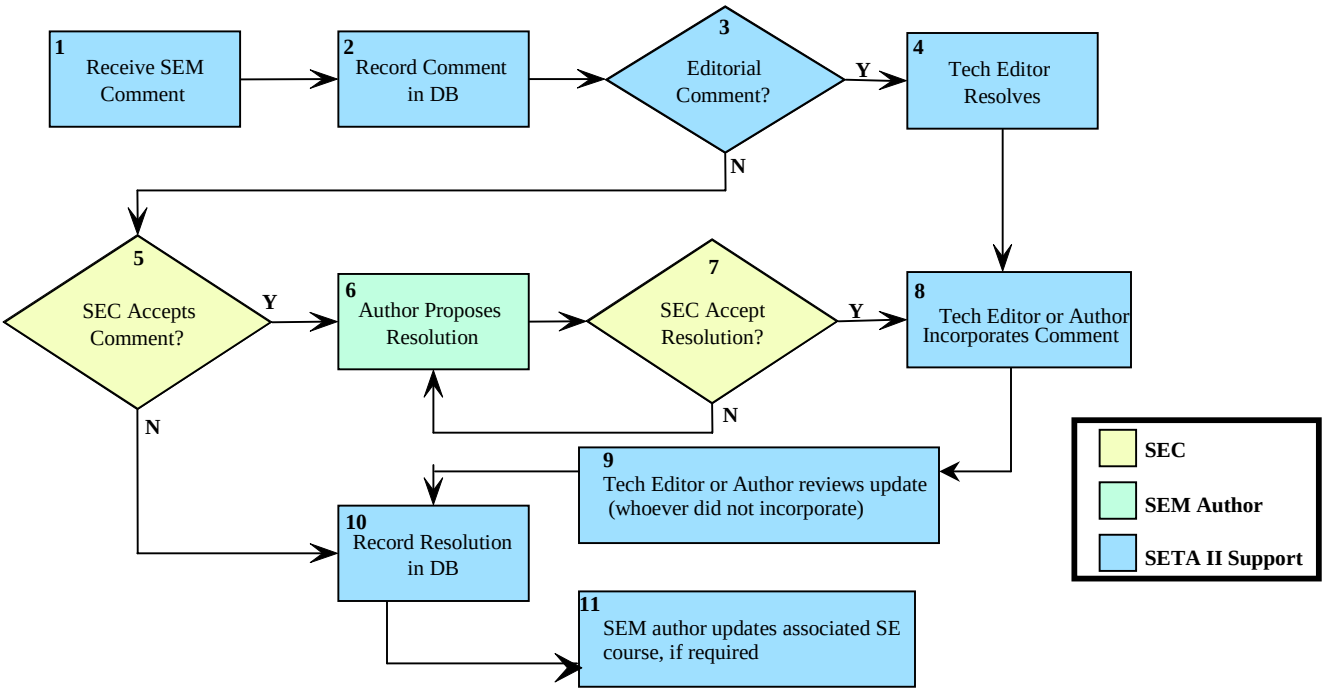


**Figure 4.14-2. System Engineering Manual Comment Process**

#### 4.14.4.1.2 System Engineering Training Information

The SEC shall monitor SE course feedback using written SE course critiques and oral feedback provided to instructors by students. Instructors shall confirm attendance using SEC Standard Operating Procedures (SOP).

Instructors shall distribute a course or workshop critique form in each course and request student feedback and shall review the forms following the course. When comment resolution requires a change to the course material, the SEM section author updates the course. If required, the author updates the SEM accordingly. The training material shall be configuration controlled, and the latest version maintained in a central location.

#### 4.14.4.1.3 System Engineering Products

The SEC is a resource to those groups implementing System Engineering in their organization. As part of this service, the SEC shall solicit feedback from services/teams producing SE products to determine if they have any recommended improvements for the SE processes in the SEM. The SEC shall also monitor the products to identify any deficiencies in the processes. The SEC monitoring activity differs from the periodic appraisal in that the SEC is looking for any obvious SE process problems and is not involved in a detailed analysis as it is during an appraisal.

#### 4.14.4.1.4 Appraisal Results

Every 3 years, the SEC shall perform an SE process appraisal using material from appropriate standard assessment models such as Electronics Industries Alliance/Interim Standard (EIA/IS)-731 or iCMM. The SEC shall monitor the organizations using the SEM processes and solicit feedback. Additionally, the SEC shall review related FAA processes to determine if any changes have been made to them that impact the SE processes.

#### 4.14.4.1.5 Other FAA Processes

The SEC shall monitor FAA business processes related to the SE processes, including AMS and iCMM, to determine if any changes to these activities warrant a change to any SE process.

#### 4.14.4.1.6 System Engineering Innovations

The SEC shall monitor technological advances in tools performing SE processes by attending SE symposiums and keeping current on the latest literature related to the discipline.

#### 4.14.4.1.7 Define Improvement

Once the SEC determines that a need for improvement exists, they shall analyze the SEM and determine what specific changes must be made. The SEC is responsible for improvements to SE processes (as documented in the SEM), the SEM, and SE training materials. When the SEC determines that an SE process change (SEM change) is necessary, they shall submit one or more SEM comments to include the issue into the SEM comment database for tracking. When the SEC approves the SEM change, it will ask appropriate authors to review the related SE training for possible update.

### 4.14.4.2 Implement Improvement

The SEC shall implement improvements using SOPs.

## 4.14.5 Outputs

### 4.14.5.1 System Engineering Process Changes

The SEC shall modify existing SE processes as necessary per the process described in section 4.14.4.1

### 4.14.5.2 System Engineering Manual Revisions

The SEC shall publish the SEM when it deems a revision is necessary—most likely biannually—based on SE process changes and SEM comments.

### 4.14.5.3 System Engineering Training Material Revisions

Each SE training course instructor (SEM member or approved designee) shall update course materials as the instructor deems necessary due to changes in SE processes or student feedback.

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### 4.14.6 References

1. Electronics Industries Alliance. *Systems Engineering Capability Model.* EIA/IS-731.1. Arlington, VA: Electronics Industries Alliance, December 1998. http://www.eia.org/.

2. Federal Aviation Administration. *The Federal Aviation Administration Integrated Capability Maturity Model (FAA-iCMM).* Version 2.0. Washington, DC: U.S. Department of Transportation, Federal Aviation Administration, September 2001. http://www.faa.gov/aio/common/documents/iCMM/FAA-iCMMv2.htm.